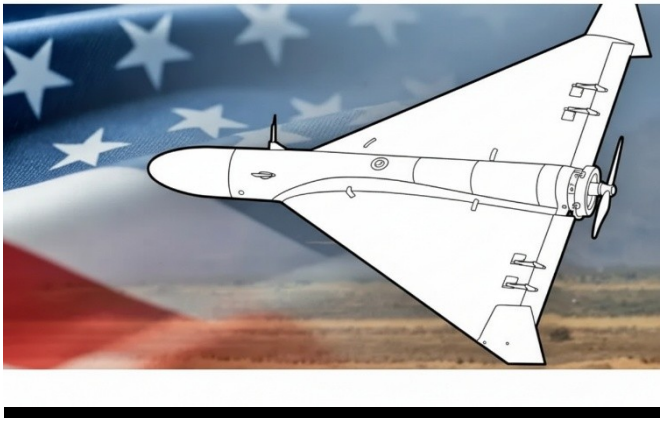
SpektreWorks LUCAS (Low-Cost Uncrewed Combat Attack System)



IDENTITY & DESIGNATION

Official Designation: LUCAS — Low-Cost Uncrewed Combat Attack System

Also Known As: FLM 136 (SpektreWorks target drone designation prior to military adoption)

Manufacturer: SpektreWorks, Arizona, USA (lead); up to 20 vendors producing airframes and warheads under distributed manufacturing model

Country of Origin: United States (reverse-engineered from Iranian Shahed-136)

Year Introduced: July 16, 2025 (Pentagon courtyard unveiling); December 16, 2025 (first ship launch from USS Santa Barbara); January 3, 2026 (reported first combat use, Venezuela)

Program Names: Precision Attack Strike Munition context; Army APFIT (Applied Small UAS Prototype Innovation Transition); Defense Innovation Acceleration program; Rapid Employment Joint Task Force; Task Force Scorpion Strike (first dedicated U.S. kamikaze drone squadron, CENTCOM)
NATO/Allied Designation: N/A

CLASSIFICATION

Domain: Air
Category: Loitering Munition / One-Way Attack Drone / Kamikaze UAS
Sub-Category: Group 3 UAS (up to 600 kg, altitudes up to 5,500 m). Low-cost attritable strike platform with modular payload options
Terminal Mode: Expendable (primary: one-way kinetic attack). Some configurations support reuse for ISR/comms relay missions
Expendable: Yes (strike mission); mission-dependent for ISR/EW/relay configurations

PHYSICAL SPECIFICATIONS

Launch Weight: 70–100 kg (154–220 lbs)
Wingspan: ~2.5–3 meters (~8–10 ft), delta-wing configuration
Length: ~3.5 meters (est., comparable to Shahed-136)
Configuration: Delta wing with visually close resemblance to Shahed-136. Piston engine in pusher configuration. Rocket-assisted takeoff capability
Warhead: 50–110 lbs of explosives (kinetic strike configuration)
Payload Bay: Modular, open architecture. Accommodates explosive warheads, reconnaissance sensors, electronic warfare modules, or communications relay equipment. Supports both 28V and 12V power supplies with in-flight payload networking and remote switching
Launch Method: Truck-based deployment; rocket-assisted takeoff (RATO); ship deck launch (demonstrated from LCS helicopter deck). No dedicated infrastructure or specialized crew training required
Airframe Material: Not disclosed; built with U.S. standards and components. Designed for mass production across multiple vendors simultaneously

PROPULSION & PERFORMANCE

Propulsion Type: Small piston engine (derived from commercial components), pusher configuration

Max Speed: ~185 km/h (~100 knots) cruise
Range: Up to 2,500 km (1,350 nmi) — matching Shahed-136 class range
Endurance: Extended — consistent with 2,500 km range at ~185 km/h cruise; estimated 13+ hours
Max Altitude: Up to 5,500 m (18,000 ft) per Group 3 classification
Range Comparison: Vastly exceeds Switchblade 600 (~40 km). Comparable to Shahed-136. Shorter than Red Wolf's 200 nmi at high subsonic, but LUCAS trades speed for range, endurance, and cost

GUIDANCE, NAVIGATION & CONTROL

Navigation: GPS/GNSS (consistent with Shahed-136 heritage; Shahed confirmed to use GNSS antenna)
Control Link: Satellite datalinks for beyond-line-of-sight control and autonomous target hunting
Networking: Integrated into MUSIC (Multi-domain Unmanned Systems Communications) mesh network. Serves as communications relay between unmanned systems and command centers in addition to strike role
Autonomy Level: Autonomous coordination with other platforms. Suitable for swarm tactics and network-centric strike operations. Autonomous target hunting via satellite datalink. AI integration planned for future variants
Swarming: Yes — designed for mass saturation attacks and cooperative autonomous engagement
Man-in-Loop Required: No — autonomous engagement capability; man-on-the-loop oversight via satellite link
Fiber-Optic Option: No

SENSORS & PAYLOADS

Primary Payload: Explosive warhead (50–110 lbs) for one-way kinetic attack
ISR Payload: Reconnaissance sensor module (modular swap)
EW Payload: Electronic warfare module (modular swap)
Comms Relay: Communications relay between unmanned systems and command centers via MUSIC mesh network
Modularity: Open architecture design. Payload bay switchable remotely during flight. Multiple payload configurations from single airframe

COST & PROCUREMENT

Target Unit Cost: Low-cost — designed to match or undercut Shahed-136 class pricing. Shahed-136 unit cost reported at $20,000–$50,000 initially; Russian domestic production target ~$48,000; upgraded variants ~$80,000. Leaked Iranian documents showed Russia paid $193,000 for early batches of 6,000 units. LUCAS targets comparable affordability with U.S. components

Production Model: Distributed manufacturing across up to 20 vendors producing airframes and warheads simultaneously. Designed for mass production at unprecedented scale for a U.S. military UAS

Development Timeline: Concept to readiness in ~18 months (vs. typical 6-year DoD acquisition cycle). Enabled by Defense Innovation Acceleration program and Trump administration "Unleashing the Dominance of U.S. Military Drones" directive (Jul 10, 2025)

Policy Context: Executive Order 14307 reclassified Group 1/2 drones as "expendables/consumables" like munitions. Same principles applied to accelerate Group 3 LUCAS fielding. Unit-level commanders given authority to directly procure drones, bypassing legacy acquisition frameworks

Cost Comparison: LUCAS at ~$50K–$100K (est.) vs. MQ-9 Reaper at $30M+ vs. JASSM-ER at $1.5M vs. Tomahawk at $2M. Designed to impose cost asymmetry on adversary air defenses: forcing expensive SAM expenditures against cheap attackers

PLATFORM INTEGRATION

Ship-Based: Launched from LCS helicopter deck (USS Santa Barbara, Dec 2025). No specialized launch infrastructure required

Ground-Based: Truck-based deployment with rocket-assisted takeoff. Designed for austere conditions with minimal logistical requirements

Operational Unit: Task Force Scorpion Strike — first dedicated U.S. kamikaze drone squadron, activated under CENTCOM in Middle East. Assigned to Rapid Employment Joint Task Force

Interoperability: MUSIC mesh network enables integration with other unmanned systems across domains. Designed for joint force employment

COUNTERMEASURE VULNERABILITY PROFILE

RF Jamming: LOW–MODERATE — Satellite datalinks and autonomous navigation reduce dependence on LOS control. However, GPS/GNSS-dependent navigation remains jammable

GPS Spoofing: MODERATE–HIGH — GNSS-dependent guidance (inherited from Shahed-136 architecture). Primary vulnerability. Autonomous target hunting via satellite may provide some resilience, but GPS spoofing remains the most effective countermeasure against this class of weapon

EMI/EMC Attack: HIGH — Commercial-derived piston engine and COTS electronics. Not mil-spec hardened. Internal wiring acts as antenna for microwave-induced voltage spikes (same vulnerability as consumer drones per Tech Ingredients demonstrations)

Microwave Attack: HIGH — Same EMI/EMC vulnerability. Unhardened commercial electronics are susceptible to HPM disruption. Coyote Block 3NK's HPM payload would be effective against LUCAS-class targets

Laser DEW: MODERATE–HIGH — Slow speed (~185 km/h), large composite/plastic airframe, predictable cruise flight path. Ideal target for high-energy laser systems. Consistent with emerging $1/shot laser C-UAS concepts

Kinetic Intercept: MODERATE — Small radar cross-section but slow and non-maneuvering in cruise. Vulnerable to SHORAD, gun-based C-UAS, and interceptor drones. In saturation attacks, individual intercept becomes cost-prohibitive — which is the point

Net / Physical Capture: LOW — Too fast and too large for net-based systems

Cyber / Hack: MODERATE — Satellite datalinks provide attack surface; MUSIC mesh network is a potential vulnerability if protocol is compromised. But autonomous fallback modes reduce impact

Active Camouflage Defeat: N/A

Overall Vulnerability Rating: MODERATE–HIGH (individual units are killable; designed to overwhelm defenses through mass and cost asymmetry rather than survivability)

COUNTERMEASURE NOTES

LUCAS inherits the Shahed-136's fundamental tactical philosophy: individual vulnerability is irrelevant when you can produce thousands at low cost. Ukraine's experience defending against Shahed swarms demonstrates that even high intercept rates (reportedly 70–80%) still

allow enough leakers to cause significant damage. The defender must be right every time; the attacker only once.

The most cost-effective countermeasures against LUCAS-class systems are: (1) GPS/GNSS denial and spoofing — the primary guidance vulnerability inherited from Shahed architecture; (2) HPM/microwave weapons — exploiting unhardened COTS electronics, effective against swarms at low cost per engagement; (3) Laser DEW systems — the emerging ~$1/shot laser C-UAS approach that Peter identified is specifically designed for this threat class; (4) AI-guided gun systems — high fire rate, low cost per round, effective against slow-moving targets.

The MUSIC mesh network adds a new vulnerability dimension not present in the original Shahed: if the mesh protocol can be compromised or spoofed, an adversary could potentially redirect, confuse, or neutralize coordinated swarm attacks. This is a double-edged sword — the networking makes LUCAS more capable than Shahed but also introduces cyber attack surface the Shahed's simplicity avoids.

For the book's cost asymmetry discussion: Russia is now producing ~3,000 Geran-2 (Shahed copies) per month according to Ukrainian intelligence. If LUCAS reaches comparable production rates, the defender's problem becomes existential — no magazine of interceptors is deep enough. This is where the laser and HPM countermeasures become not optional but essential.

CRUISE MISSILE CONVERGENCE NOTES

LUCAS is the convergence thesis made explicit by official U.S. policy. The Pentagon looked at the Shahed-136 — a weapon that RUSI argued should be classified as a cruise missile rather than a loitering munition because it flies point-to-point suicide missions — and said "we need that." The U.S. Air Force RFI literally asked for "a 1:1 copy."

The Shahed-136/LUCAS class occupies the exact center of the convergence spectrum this book documents. It is simultaneously: a drone (unmanned, autonomous, GPS-guided), a cruise missile (turbo/piston propelled, flies a pre-programmed route to a fixed target, carries an explosive warhead), and a loitering munition (can orbit a target area before striking). The categories have fully collapsed. The only honest term is "one-way attack UAS" — which is just a cruise missile described in drone vocabulary.

What LUCAS adds to the Shahed template is the American networking layer: MUSIC mesh, satellite datalinks, autonomous target hunting, swarming coordination. This transforms a dumb cruise missile into a networked autonomous weapons system. The Shahed is a V-1 buzz bomb with GPS; LUCAS is a V-1 with a brain and friends.

The production philosophy is the convergence endgame. Twenty vendors simultaneously producing airframes and warheads, commanders procuring drones at unit level like ammunition, 18-month concept-to-deployment timelines — this is cruise missile production at munitions-factory scale. When the U.S. military treats a 2,500 km range autonomous strike weapon as a consumable, the distinction between “drone” and “cruise missile” is not just blurred, it’s gone.

Compare the trajectory: the original Tomahawk BGM-109 that Peter worked on was a $2M weapon with redundant INS/TERCOM/DSMAC guidance, built in hundreds. LUCAS achieves 80% of the Tomahawk’s range at perhaps 2–5% of the cost, with autonomous swarming capability the Tomahawk never had. The convergence from below (cheap drones becoming cruise missiles) and from above (cruise missiles becoming cheap drones) has met in the middle — and LUCAS is standing there.

OPERATIONAL HISTORY

Development traces to SpektreWorks FLM 136 target drone program; selected for Army APFIT program. Defense Innovation Acceleration funding moved system from concept to readiness in ~18 months. July 10, 2025: Trump administration directive “Unleashing the Dominance of U.S. Military Drones” (Executive Order 14307) signed by SecDef Hegseth, reclassifying small drones as expendables and accelerating acquisition. July 16, 2025: LUCAS formally unveiled at Pentagon courtyard display of 19 autonomous multi-domain systems, reviewed by SecDef Hegseth. SpektreWorks confirmed system tested and ready for production. September 2025: Integrated into Rapid Employment Joint Task Force. December 2025: Task Force Scorpion Strike activated under CENTCOM — first dedicated U.S. kamikaze drone squadron. December 16, 2025: First ship-based launch from USS Santa Barbara (LCS-32) in Arabian Gulf. January 3, 2026: Reported first large-scale combat use during Operation “Absolute Resolve” in Venezuela — local video evidence captured characteristic engine sound of Shahed-type loitering munitions before impact. Defense analysts assessed positive

first combat experience, suggesting continued operational employment. Iran's Armed Forces spokesman stated U.S. replication "validates growing global recognition" of Iranian drone superiority. Multiple allied nations expected to seek LUCAS export variants for Indo-Pacific and regional defense.

SOURCES & CROSS-REFERENCES

Manufacturer: SpektreWorks (spektreworks.com)
Image (ship launch): U.S. Navy photo — LUCAS launch from USS Santa Barbara, Dec 16, 2025 (public domain)
Image (Pentagon display): U.S. DoD photo, Pentagon courtyard, Jul 16, 2025 (public domain)
Key References: Army Recognition: "US develops LUCAS kamikaze drone" (2025); Defence Blog: "U.S. develops its own version of Iranian kamikaze drone" (Jul 2025); Defence Blog: "U.S. makes combat debut of kamikaze-style drones" (Jan 2026); Defense Security Monitor/Forecast International: "LUCAS: Scaling the Drone War" (Dec 2025); Defence Security Asia: "U.S. Unveils LUCAS Drone" (Dec 2025); Global Defense Corp (Jan 2026); The Aviationist (Feb 2026)
Cross-Ref: Shahed-136/Geran-2 (A-016, Iranian original); Shahed-238 (A-019, jet variant); Switchblade 600 (A-021, smaller loitering munition); Red Wolf (A-023, higher-end mini cruise missile); Coyote Block 3NK (A-022, HPM countermeasure to this class); Volume 1 Section 20.1 (Microwave Countermeasures); Volume 1 laser DEW C-UAS discussion

AI INTEGRATION — COMPETITIVE ADVANTAGE LAYER

The LUCAS airframe is deliberately unimpressive on paper. Same delta wing as the Shahed-136. Same piston pusher engine. Same GPS/GNSS guidance inherited from the Iranian original. The competitive advantage is not in the airframe — it is in the software stack riding above it. Defense reporting has specifically identified Anthropic among the leading technology firms contributing AI frameworks and defense software architecture to American drone systems. These AI systems enable LUCAS to do what the Shahed cannot: recognize targets, coordinate swarms, adapt routing, and respond to electronic countermeasures — not by following pre-programmed instructions, but by reasoning about the tactical situation in real time.

ENGINEER'S NOTE: The LUCAS airframe is a $50,000 delivery vehicle for a reasoning engine. The Shahed-136 has GPS coordinates and a detonator. LUCAS has GPS coordinates, a detonator, AND the ability to think about what it sees on the way to the target. That is not an incremental improvement. That is a categorical shift in what a one-way attack drone can do. When Anthropic-class AI reasoning meets a mass-producible expendable airframe, the cost-exchange math of drone warfare changes at the foundational level.

The AI integration layer enables four specific capabilities the Shahed-136 lacks: (1) Target recognition — LUCAS can identify and discriminate between target types during terminal approach, reducing fratricide and increasing precision without GPS precision coordinates. (2) Swarm coordination via MUSIC mesh — drones can communicate, assign targets, deconflict attacks, and adapt to losses within the swarm in real time. (3) Adaptive routing — if GPS is jammed or spoofed on the planned route, AI navigation can adjust course using visual and inertial references rather than failing. (4) Electronic countermeasure response — the system can detect jamming attempts and respond with countermeasures or routing changes, rather than flying blind into a denial zone.

The CSIS "Russia-Ukraine Drone War" panel (2025) framed this advantage directly: the decisive US edge over Iran in the drone competition lies not in airframe geometry but in "advanced AI ecosystems and integration capabilities" — the software layer that transforms a cheap expendable into a smart weapon. The Shahed is a V-1 buzz bomb with GPS coordinates. LUCAS, with AI integration, is a V-1 that can think.